Miller, Diane M.

From: cecolton@mmm.com
Sent: Wednesday, August 31, 2005 9:49 PM
To: NIOSH Docket Office
Subject: NIOSH DOCKET -052

Final Letter to niosh docket o...

To whom it may concern:

Attached are our comments regarding the User Guidance Document on CBRN Air Purifying Respirators.

Please place these comments in the above identified docket.

Thank you.

(See attached file: Final Letter to niosh docket office on APR user guidancer.pdf)

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August 31, 2005

NIOSH Docket Office, Reference: NIOSH DOCKET -052
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RE: ATTENTION, EMERGENCY RESPONDERS: NIOSH Interim Guidance on the Use of Chemical, Biological, Radiological and Nuclear (CBRN) Full Facepiece, Air-Purifying respirators/Gas Masks Certified Under 42 CFR Part 84CBRN APR User Guide

Dear Docket Officer:

Minnesota Mining and Manufacturing Company (**3M**), through its Occupational Health and Environmental Safety (OH&ES) Division, is a major manufacturer and supplier of respiratory protective devices throughout the world. 3M has invented, developed, manufactured and sold approved respirators since 1972. We have developed numerous training programs, videos, computer programs and technical literature to help our customers develop and run effective respirator programs. Our sales people have trained and fit tested hundreds of thousands of respirator wearers throughout the world. Our technical staff has performed basic research on the performance of respirators and their uses, presented and published this data in numerous forums and participated in the development of the ANSI Z88 standards on respiratory protection. In sum, we have substantial experience in all phases and applications of respiratory protection. We are pleased to provide the National Institute for Occupational Health and Safety with our comments on the user guidance document entitled, **ATTENTION, EMERGENCY RESPONDERS: NIOSH Interim Guidance on the Use of Chemical, Biological, Radiological and Nuclear (CBRN) Full Facepiece, Air-Purifying respirators/Gas Masks Certified Under 42 CFR Part 84CBRN APR User Guide.**

3M supports NIOSH in its attempt to develop a user guidance document for respirator use in atmospheres that may contain chemical, biological, radiological, and nuclear (CBRN) war agents. We offer the following comments and recommendations

regarding the **ATTENTION, EMERGENCY RESPONDERS: NIOSH Interim Guidance on the Use of Chemical, Biological, Radiological and Nuclear (CBRN) Full Facepiece, Air-Purifying respirators/Gas Masks Certified Under 42 CFR Part 84CBRN APR User Guide.**

We appreciate the opportunity to add our comments and knowledge to the rulemaking record and look forward to the promulgation of a fair, protective and useful standard.

Sincerely,

Robert A. Weber
Technical Service Manager
3M Occupational Health & Environmental Safety Division

RAW:CEC/llb
Enclosures

3M Comments to NIOSH's July 8, 2005 Draft for Discussion

In the Specific Comments, the following format was used:

- **Bold print** identifies the specific section or paragraph for each comment.
- "**Comment**" is a short, direct comment with the 3M recommended or suggested change with a brief explanation as to the need for the change.
- "**Revised with comment**" is a rewrite of the text with the changes incorporated where it was thought it would help clarify the change.
- Blue print highlights the change.

Page 9, Second paragraph, line 3
Comment: The word "Contaminate" should be replaced with "Contaminant".
Revised with Comment: "Contaminant quantities..."

Page 9, 4th paragraph
Comment: We disagree that the olive green NIOSH label alone is sufficient to identify a NIOSH CBRN canister. Olive green is the label color for mercury vapor, multi gas, hydrogen fluoride, formaldehyde, ethylene oxide and vinyl chloride. The letters "CBRN" by themselves provide proper identification.
Revised with Comment: "A NIOSH-approved CBRN APR has an olive green NIOSH canister label affixed..."

Page 9, paragraph 4, line 9
Comment: Change "could" to "will".
Revised with Comment: "This is important because inadvertent mixing of similar parts on a respirator ~~could~~ will void the NIOSH approval..."

Page 9, Section 2, line 1
Comment: Whether a CBRN agent is "respiratory" depends on if it is airborne or not.
Revised with Comment: ~~Respiratory~~ CBRN agents are chemical, biological, radiological, and nuclear ~~inhalation~~ hazards which have the potential to be released and become airborne, creating an inhalation hazard during acts of terrorism.

Page 10, first paragraph, line 7
Comment: The word "portions" is confusing as used in this context and its meaning is not clear.
Revised with Comment: "The TRA are 10 gases and 1 particulate oil aerosol for canister filtration testing and they represent ~~different portions~~ all of the types of the total..."

Page 10, Section 2a.
Comment: The opening paragraph implies the CBRN APR can only be used for the 139 agents that NIOSH has identified. This position is too restrictive. For example, it could have prevented these respirators from being used on 9/11 for a broader range of

contaminants. From OSHA's perspective, this respirator is approved and effective for silica and asbestos and could be used accordingly.
Revised with Comment: The CBRN APR provides protection against 110 chemical gases, vapors, and solid/liquid chemical aerosols identified as potential CBRN agents by the NIOSH/U.S. Army RDECOM threat analysis as well as many other chemicals.

Page 11, First paragraph in section 2b.
Comment: "Toxin" by itself applies to many chemicals. In the sense that it is used here, the definition should indicate that it is limited to toxins produced by microorganisms.
Revised with Comment: Biological agents consist of micro-organisms such as pathogens (which include disease causing bacteria, rickettsiae, and viruses) and toxins produced by microorganisms.

Page 11, sections 2b and 2c
Comment: These sections indicate that the filter is effective only for biological, radiological and nuclear agents. This is too limiting. Since the filter is a P100 particulate filter it is effective against many other aerosols including for example, those generated from building collapse etc.

Page 12, First full paragraph, last sentence.
Comment: The last sentence is a nice statement, but adds nothing to the understanding for proper use of the CBRN respirator and should be deleted.

Page 13, First paragraph, bullet 4, footnote 2.
Comment: The footnote indicates that the NIOSH IDLH values are the proper ones to use; yet OSHA does not use these numbers for enforcement. Further, there are several contradictory positions expressed between the 2004 Pocket guide and OSHA's PEL's. For example, the NIOSH method used to revise the IDLHs resulted in IDLHs equal to or less than OSHA PELs. As a specific instance, the 2004 IDLH for tetrachloroethylene is 150 ppm. The OSHA PELs for tetrachloroethylene include a TWA, a Ceiling limit that allows for 5 minutes of exposure above 200 ppm and below 300 ppm in any 3 hour period and a maximum peak of 300 ppm. To comply with OSHA, one does not need a respirator until the concentration reaches 200 or 300 ppm if they are in compliance with the TWA for tetrachloroethylene, yet NIOSH "requires" an SCBA. If 150 ppm were the IDLH, one would expect that many fatalities would have occurred but this is not the case. OSHA has over 30 years of experience with the exposure limit at these levels. The 2004 Pocket Guide should not be used.
Revised with Comment: 2 The 1990 NIOSH Pocket Guide to Chemical Hazards lists IDLH values established by NIOSH for many chemicals.

Page 13, footnote 3.2
Comment: 3M is not aware of any manufacturer establishing MUCs and therefore this comment should be deleted. There are already enough issues for the user to consider besides adding things that may not exist.

Page 14, first sentence.
Comment: This sentence indicates that the limitations listed here only apply to non-CBRN events and implies, that CBRN respirators are not appropriate in such conditions. We believe, however, these limitations apply in all situations and are not unique to CBRN.
Revised with Comment: Cautions and limitations lettered as A, I, J, L, M, O, and S (located in Section 2 of these labels) apply ~~when non-CBRN~~ to all use situations. ~~conditions are present.~~

Page 14, Cautions and Limitation I
Comment: First, this is not even a limitation that is listed in the statement of standard and should not be added here. At a minimum, it should be indicated that this limitation would only appear when the respirator has electrical parts.

Page14
Comment: It is 3M's position that it would be more appropriate to use caution H for the canister change schedule section since it applies to non-CBRN conditions as well as CBRN conditions. It could then be removed from limitation HH.
Revised with Comment: H; Follow established cartridge and canister change schedules or observe ESLI to ensure that cartridges and canisters are replaced before breakthrough occurs. "**HH" When used at defined occupational exposure limits, the rated service time cannot be exceeded.** ~~**Follow established canister change schedules or observe End-of-Service-Life Indicators to ensure that canisters are replaced before breakthrough occurs.**~~

Page 15, Caution and Limitation R
Comment: The conditions described here are not a limitation of the respirator. In fact this statement does not provide any information that is specific to respirator use. This is information that needs to be provided under the hazard communication process and applies even when engineering controls are effective. In addition, this section provides some erroneous information. A CWA is not always more toxic than a TIC. There are several TICs that are worse than the CWAs. It depends on the chemical and therefore, this type of general of a statement is not appropriate. CWAS should be defined the first time it is used or refer the reader to the glossary. Furthermore this discussion does not address the point of the "limitation."
Revised with Comment: ~~**"R" Some CBRN agents may not present immediate effects from exposure, but can result in delayed impairment, illness, or death.**~~
~~Highly toxic agents and toxicity is not related to volume of contaminating agent. In other words, a very small amount of CBRN agents, particularly CWA, can kill, de-habilitate or render useless in a short amount of time. In comparing a CWA and a TIC, the CWA is more toxic and requires a much lesser amount to achieve its effects. The TIC requires bulk quantities of compound to achieve the same level of toxicity and effect..~~ Some deadly exposures may take up to 24 hrs before an effect is noticed, e g., pulmonary edema caused by many chemicals.

Page 15, T
Comment: As written, this paragraph may cause some users to believe that the respirator has a clock in it. A clearer and more thorough explanation is needed to explain the "CRUL clock". The last sentence in this paragraph is also confusing as worded.
Page 15, V
Comment: This is a limitation that applies to all uses: CBRN or non-CBRN.

Page 16 W
Comment: The explanation avoids the issue of canister interchangeability and should be addressed here. In the last sentence the use of the word "generated" is not appropriate.
Revised with Comment: If non-CBRN approved parts are used as replacement parts in CBRN APR the new configuration ~~generated~~ voids NIOSH approval.

Page 16, Y
Comment: The word "gradient" in the explanation is confusing and not needed. Non-traditional terms that are used also add to the confusion and ambiguity of this paragraph.
Revised with Comment: Radioactive particulate hazards are protected against by the integral P-100 filtration media provided the concentration ~~gradient~~ does not exceed the protective capabilities of the respirator. A proper ~~sealing techniques of use must also be done~~ face seal is necessary to ensure that the canister is not bypassed by contaminants as they enter into the breathing zone by compromised seal characteristics of the respirator facepiece-to-face sealing area. ~~to face interface region~~. Monitoring of radiation levels along with full radiation time, distance and shielding must be understood and implemented.

Page 16, Z explanation
Comment: An important parameter was omitted: the specific test concentration. In addition, the wrong word, probably a misspelling was used for "ally" in line 5.
Revised with Comment: CBRN APR canisters are required to provide protection for a minimum service life of 5 minutes when tested at the specified test concentrations, at a flow rate of 100 liters per minute, at 50+/-5% humidity and 25 +/- 5 deg C for each gas/vapor identified in the canister test challenge list. This means the canister is rated to provide you an extra level of protection to ~~ally~~ allow escape from a detonated secondary device respiratory hazard.

Page 17, HH
Comment: The first sentence of this limitation appears to be misstated for the following reasons: The Cap 1 has a rated service life of 15 minutes. Defined occupational exposure limits include the RELs, PELs and TLVs. So what this statement says is that the canister can never be used for more than 15 minutes when the respirator is used at concentrations equal to the occupational exposure limits. This brings into question how long the canister should be used if the concentration is greater than the occupational exposure limit. This is apparently controlled by the change schedule. If this is not changed to be consistent with limitation H, it should be revised as follows.
Revised with Comment: ~~**"HH" When used at defined occupational exposure limits, the rated service time cannot be exceeded.**~~ **Follow established canister change**

schedules or observe End-of-Service-Life Indicators to ensure that canisters are replaced before breakthrough occurs.

Page 17, HH explanation
Comment: The explanation appears to confuse the canister service life with that of the CRUL by bringing in the 480 minutes.
Revised with Comment: Air-purifying respirators require specific canister change schedules. ~~deliberate use decision logic. CBRN CAP 1 is a rated service time for a CBRN canister. The entire CBRN APR, as a system has a 480 minute service life against GB and HD, a 15 minute test time against the TRA and a 5 minute high flow test time against the TRA. Do not exceed the use life of the canister because the canister is the component that has the shortest rated service time and therefore the default for use is to the canister.~~ Establish a canister change schedule. Establish ~~and~~ a respirator disposal schedule upon direct contact with CBRN agents, especially CWA. Use detection and monitoring operations to provide end of service life indicators that may contribute to canister replacement before breakthrough occurs.

Page 18, 3c
Comment: The question of being able to use a CBRN APR for industrial applications has significant consequences and needs to be clearly addressed. The opening sentence here, however, falls short of bring the needed clarity to this issue. Notwithstanding NIOSH's position as expressed, there are clearly instances when a CBRN APR will provide protections in an industrial environment where an APR was not previously available, such as exposures to phosgene. Moreover, there could be circumstances where first responders having CBRN APRs will need protection from the hazards generated from using a cutting torch, such as silica dust or metal fumes – industrial applications- where the CBRN APR would be appropriate.

Page 19, section 3d
Comment: If a canister is used during an escape, the canister must be replaced after use because the remaining service life is not known and an effective change schedule cannot be established.
Revised with Comment: After using the respirator to escape, the canister ~~should~~ must be replaced before reusing the respirator.

Page 19, 3e, second paragraph
Comment: Accepted terminology should be used rather than "viable surface" and "working seal?"
Revised with comment: The thread depth of the canister also ~~a viable sealing surface~~ is important as it must ~~that~~ mates to the connector gasket and ~~provides a working~~ form a tight seal.

Page 19, 3e, third paragraph
Comment: This paragraph gives permission to the incident commander to use different manufacturers' canisters and should point out that there are no standards to give guidance

in these circumstances. The incident commander, therefore also needs to know that these actions void the approval and they are assuming responsibility for that action.

Page 21, second paragraph
Comment: This paragraph lists air-flow rate resistance as a factor affecting service life. It is 3M's position that airflow rate resistance does not affect service life. At different resistances, the airflow will be different at the same work rate. If the worker isn't getting enough air, they raise their effort and thus airflow. Therefore airflow will meet the requirement. "Cartridge" does not need to be included since CBRN APR are only approved with canisters.
Revised with comment: "Actual service life of the CBRN canister is determined by the type of substance being removed, the concentration of the substance being removed, the ambient temperature at the time of removal, the specific ~~filtration element~~ canister being ~~tested~~ used ~~(cartridge or canister)~~, the air-flow rate ~~resistance~~, and…"

Page 22, first line
Comment: The use of "e.g." should be "i.e.".
Revised with comment: "… canister capacity (~~e.g.~~ i.e., each level is referred to as a specific Cap).

Page 23, fourth paragraph
Comment: We believe this paragraph should be modified to more clearly explain to the user the reasons for the CRUL.
Revised with comment: The 8-hour (vapor) and 2-hour (liquid) use life means eight continuous hours or two continuous hours in a single shift, day, or event. ~~The time intervals are continuous and cannot be divided; for example, the 8-hour period cannot be broken into four different 2-hour periods over the course of a day~~. Once permeation is started as a result of exposure to either liquid or vapor, permeation will continue even in the absence of additional liquid or vapor exposure to the respirator. Permeation will not stop once it has been exposed so the time period for the use life is a continuous time.

Page 23, section 7
Comment: The CRUL has already been discussed so section 7a is redundant. At a minimum the first three paragraphs of 7a should be moved to section 6. Section 7 should be renamed to Methods for Determining a Canister Change Schedule. Section 7b should replace 7a. A new section should be started dealing with the use of the CBRN respirator that includes the left remaining paragraphs from section 7a.
Revised with comment: 7. Methods for Determining a Change Schedule
There are several methods available for determining a canister change schedule for gases and vapors. It is important to remember that these methods apply only to gases and vapors, not to particulates. These methods include:
~~• CBRN Respirator use life (CRUL)~~
• Software
    - using the specific chemical
    - using a NIOSH Test Representative Agent (TRA) chemical

• Manufacturers' test data (for a specific chemical or NIOSH test representative agent (TRA) chemical)
• "Rules of Thumb"
7b. Software ....

Page 24, (1) Recommendation...
Comment: This section does not fit under the CRUL discussion and needs a new heading as presented below.
Revised with comment: 8. Use Recommendations for the CBRN APR
The following recommendations are applicable to defining best practice use guidelines relevant to the use of the CBRN full face, tight fitting, nonpowered air-purifying respirator, also known as a gas mask: ....

Page 24 a.
Comment: This recommendation is confusing and does not use commonly accepted terminology.
Revised with comment: Replace worn out items and ensure the APR has not permanently ~~creased the faceblank~~ deformed the facepiece while in storage.

Page 24 e
Comment: This is a good reminder to keep the caps on the canister until placed on the respirator. It is recommended that terms be used that are better understood by potential users, e.g., civilians.
Revised with comment: e. Maintain a contingency ~~stockage~~ supply of unopened canisters, minimum two each per respirator, for real event use. Follow manufacturer's recommendations for storage. Have systems in place that prevent inadvertent mixing of training and contingency canisters while in storage or in the workplace. Ensure all canister inlet and outlet caps are taken off prior to actual donning and use.

Page 24, f
Comment: Replace the word "stockage".
Revised with comment: f. Ensure that contingency canisters and the APR ~~stockage~~ supply is rotated as its shelf life expires or is found defective.

Page 25 first 12 lines
Comment: Change time of exposure to "duration." As worded it sounds like it depends on the time of day, not the length of time in use. Remove the word "gradient." Overall this paragraph needs more clarity of intent and purpose.
Revised with comment: Actual use is dependent on the concentration ~~gradient~~ of exposure, weather conditions, and ~~time~~ duration of exposure. "With riot control agent, the integrated P-100 particulate filter of the CBRN APR..." It is not recommended to just use a particulate N-series, R-series, or P-series industrial particulate filter for CS even if one of these filters is approved for use with a CBRN ~~APR~~ facepiece. For a CBRN response, use a CBRN rated canister on the CBRN ~~approved respirator~~ facepiece to make an approved respirator assembly.

Page 25, n
Comment: The other factors that can interfere with optimum sealing such as temple bars on glasses should be added. The spectacle kits will need to be obtained *before* an incident.

Page 25, p
Comment: This recommendation overlooks the fact that some CBRN facepieces will have non-CBRN approvals.
Revised with comment: p. Do not mix- match CBRN and non-CBRN parts on a CBRN APR for CBRN applications.

Page 25-26, first line
Comment: The second sentence is confusing especially due to the use of the terms "like parts" and "like CBRN." Most importantly, there is no definition of what factors make one part "like" another. Similarly, what constitutes "like CBRNs"? Based on the statement that NIOSH "fully endorses the use of all like parts on a like CBRN APR…' is like referring to the parts listed on the approval matrix. If so it should be clearly said. Also, should the NIOSH approval numbers really be annotated? In addition, the use of "IC" has never been defined and is not included in the list of acronyms. The IC cannot ensure the requirements in the last highlighted lines below unless appropriate test equipment is identified and available. NIOSH has specified a breathing resistance value for the canisters so one does not need to check for resistance and a common thread to ensure all canisters mate correctly. If it doesn't perhaps this part should be removed from the statement of standard.
Revised with comment: When the situation warrants the use of ~~other~~ ~~like but different~~ CBRN canisters other than the manufacturer of the facepiece ~~canisters~~, NIOSH recommends the CBRN Cap ratings match and the NIOSH approval numbers be ~~annotated~~ recorded to support use decision logic. CBRN Capl canister from one manufacturer can be replaced with another like CBRN Cap 1 canister from a different manufacturer. If this process cannot be avoided and the IC must determines that interchangeable canisters can be used, ensure the CBRN Cap 1 rating is confirmed, ensure threaded connector mates correctly with interchangeable canister and ensure interchangeable canister does not adversely impact on breathing resistance, air flow or vision and ensure the wearers can install the canisters without cross threading.

Page 26 (2)
Comment: This section introduces the term "unmask", or "unmasking" which are not terms used by civilian first responders. The word doffing is also used in other places. NIOSH should standardize on a term, preferably doff or doffing.

Page 26 e
Comment: The "two-man" concept appears to be a new term for the "buddy system." Because "buddy system" appears in standards and is generally recognized by health and safety professionals as well as the fire service, it should also be used here.
Revised with comment: e. Use the ~~two-man concept~~ buddy system to ensure each responder is properly protected.

Page 26 f
Comment: At the beginning of this paragraph "all clear" is used to indicate it is safe to unmask. Later, the example tells the reader to use "All Clear" when an incident has been detected. This is the time that we would think the respirator should be donned, but all clear indicates it is time to remove the respirator.
Revised with comment: f. Use common commands that tell all concerned when to don APRs in an attempt to preclude exposure. Use common all clear commands to tell all responders when it is safe to un-mask. Use all communications means available to conduct this warning program. Such examples might be verbal "GAS, GAS, GAS" with corresponding hand movements to tell responders a CBRN incident has been detected or expected to indicate when the respirator should be donned and ~~when~~ once donned and "All Clear", "All Clear" voice command or other equivalent techniques to tell responders a CBRN incident ~~has been detected or expected~~ is over or it is okay to remove the respirator.

Page 27, g
Comment: Awkward wording
Revised with comment: g. Indicators ~~of terrorist~~ for possible use of CBRN by terrorists are vital to the responder.

Page 27 n, line 4
Comment: There is a typo here.
Revised with comment: The tendency to take off the CBRN APR will be tremendous.

Page 28, h, line 3
Comment: The "liquid control line" and "vapor control line" should be defined because most readers will probably not know what they mean. In addition, testimony given at the public meetings indicated that if liquid was present, it was IDLH and the CBRN APR is not approved for entry into that area.

Page 28, j
Comment: The discussion on decontamination needs to separate CWAs from the other materials. If contaminated with CWA, the respirator will be going to disposal and it is not conceivable anyone, might be opening the bag.

Page 29, 7b Software, first line
Comment: Data software is confusing and implies a spreadsheet where data are entered.
Revised with comment: " ~~Data~~ Software programs available on the OSHA website …"

Page 29 7b, third paragraph
Comment: The last sentence should be modified and moved to the end of the second paragraph.
Revised with comment: The respirator manufacturer may have a software program on their website which includes their specific CBRN canister and CWA. Users should contact the manufacturer for questions about using a manufacturer's software program.

The OSHA software and some manufacturer's software also allows for chemical data (such as molecular weight and vapor pressure) to be entered if the specific chemical is not listed in the software's database.

Page 29, 7b, last paragraph
Comment: It is not clear as to why only the NIOSH TRAs can be used as surrogates. It is possible to select a surrogate that may give a better prediction of service life than the TRA. For example, there are much better surrogates for GB than cyclohexane when it comes to estimating canister life. In addition, the last sentence is not correct. A person could enter the number of ppm of the acid gas expected or that is present and run it as each of the 5 TRAs singularly and use the most conservative estimate. Delete that sentence.

Page 30, 7c Manufacturer's Test Data (not software)
Comment: It appears that NIOSH is telling the user that the canister can not be used any longer than the CAP level, for example a CAP 1 canister could only be used for 15 minutes. This is inconsistent with establishing a canister change schedule. This document, in our opinion, never clearly states that the canister will be disposed of based on the shortest time of either the CRUL when the entire respirator is discarded or when the time for canister change schedule is reached.
Revised with comment: For those agents which are chemical warfare agents, the canister service life is limited by the CBRN respirator use life (CRUL) limitations stated in caution and limitation 'UU' or the time established for the change schedule, whichever is shorter. The CRUL for a CBRN APR system service life is a maximum of 8 continuous hours for a CWA gas or vapor or 2 hours for a CWA liquid and the canister is disposed along with the rest of the respirator system. If the canister service life as indicated by the change schedule is less than CRUL for either the liquid exposure or vapor exposure, the canister would be changed at that time.

Page 30, 7d, Rules of Thumb
Comment: As a minimum, we recommend that NIOSH cite the most recent edition of publications. The second edition of the AIHA publication was issued in 2003. Rules of thumb should be used in conjunction with the manufacturer's data only; not as a stand-alone. The discussion on cartridges is not appropriate since these are canisters.
Revised with comment: The *Rules of Thumb* may provide a rough estimation of canister service life, but only for single organic vapors (AIHA 2003). However, they should **NOT** be used as the sole method of determining service life. And entering into the rules of thumb with a chemical warfare agent can produce varying results. ~~These rules state that industrial organic vapor cartridges will last eight hours if the organic vapor has a boiling point of greater than 70°C, the vapor's concentration is less than 200 ppm, and the worker has a breathing rate of 30 liters per minute (moderate work).~~ These rules state that service life is directly proportional to the amount of carbon. Therefore cartridge service life for a cartridge can be increased proportionally for a canister.

Page 32, definition of Assigned Protection Factor
Comment: This definition should be very clear that this is the NIOSH recommended APF.

Revised with comment: An APF of 50 is assigned by NIOSH to the CBRN APR.

Page 32, definition of Biological Agents
Comment: It should be clear that the toxins mentioned here are those produced by microorganisms.
Revised with comment: **Biological Agents** – Biological agents consist of micro-organisms such as pathogens (which include disease-causing bacteria and viruses) and those toxins produced by microorganisms.

Page 32-33, definition of Chemical Warfare Agents
Comment: This definition includes additional chemicals that may degrade the respirtor materials, but the user has no way of knowing what those chemicals are. Hence, the definition is unrealistic.
Revised with comment: "...~~chemicals that exhibit degrading or destructive effects on respirator materials, and other chemicals for which decontamination procedures are unable to decontaminate the respirator to a safe level for reuse~~."

Page 33, definition of Maximum Use Concentration
Comment: This does not recognize that any limit OSHA sets is a PEL. The last part could be changed to include TLVs and the types of PELs could be dropped.
Revised with comment: An OEL can be a NIOSH recommended exposure limit (REL), an OSHA permissible exposure limit (PEL), expressed as a TWA, a short term exposure limit, ceiling limit, or peak limit, or ~~any other exposure limit for a hazardous substance~~.

Page 35, definition of Test Representative Agent
Comment: All 10 agents are not gases. Cyclohexane is a vapor. This is only important to be technically correct.
Revised with comment: Refers to any of the 11 chemicals (10 gases and vapors and 1 particulate ~~aerosol~~) NIOSH uses for certification testing of the CBRN APR canister.

Page 39. Organic vapor table
Comment: This says the CWAs are in the organic vapor family, but this is not correct. The blood agents, which are CWAs, are not in the OV family.